

Easily & Economically Feasible Value Analysis & Value Engineering Concepts for Manufacturing Industry

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Abstract

Value engineering has become an essential concept in majority of the public and private sector industries. Most of the Indian companies have shown interest in adopting and few of them have adopted the value engineering concepts successfully. Especially in Indian industries, there has been a lack of understanding in value engineering concepts and its implementation among industrial practitioners. This study discusses different critical issues pertaining to cross functional team and processes of flow chart and FAST diagram (Functional Analysis System Technique) has been developed for Value Analysis & Value Engineering (VAVE) suitable for an automobile industry. Through this study an attempt has also been made to make value engineering concepts simple, suitable and applicable, especially in manufacturing industries.

Keywords

Value Analysis (VA); Value Engineering (VE); Fast Diagram; Go Fast Workshop

Introduction

The concept of value engineering had come in to existence during World War II, when the manufacturing industries were facing the problem of material shortages as the consumption increased for war needs (Charles et.al. 2005). Value engineering has been successfully implemented in several construction projects worldwide (USEPA, 1977). In India some value engineering concept have been in practice in construction industry since last two to three decades but in industrial sector there is complete lack of understanding of different concepts of value engineering and methods of its implementation.

Value engineering is a problem-solving approach based on creative and positive thinking that is used to fulfil the required function(s) and provide the appropriate quality at the minimal cost. It is also considered as a process, a methodology and a job rather than a

program. Value engineering requires significant upfront planning and time to secure full savings benefits. The biggest obstacle in executing the VE projects is often the needs to validate the product design changes and to solve issues like cost, time, and risk (Mansour Farid Fam 1999). Tabatabai-Gargari and Elzar ka in 1998 described that how the integration of knowledge-based systems and computer-aided design systems could generate design alternatives and improve the accuracy of cost estimates, in two major steps in a typical value engineering study.

Value Analysis is a continuous improvement process driving cost reductions during the production phase of the product life cycle. In other words, VA is a creative, organized approach with the objective of optimizing life cycle costs and of the performance of a system, facility or building. The extremely simple concepts of value engineering make it suitable and applicable in different industrial sectors, like construction industry, textile industry, power sector, automobile sector etc. Within India the prospects of implementing value engineering in the corporate and industrial sector are bright, but it required proper understanding of different concepts of value engineering. This study aims to discuss the basic techniques of *Value Analysis & Value Engineering (VAVE)* and how cost reduction through VAVE ideas can be implemented under the six phases (i.e. Information, Creativity, Evaluation, Development, Presentation and Implementation) of *Go Fast workshop* in an automobile company.

Methodology

A successful VAVE process requires close cooperation among Purchasing, Quality, Production, Engineering, Marketing, and Finance within the organization.

- **Purchasing:** A buyer in the company selects supplier capable of producing a quality part at

the lowest price.

- **Quality:** Quality engineer first inspects the specifications of parts as per the quality standard then approve the selected parts.
- **Production:** Production Engineer works with suppliers to eliminate waste in all elements of the production processes.
- **Engineering:** Design engineer makes the design and develop cost efficient product that meets marketing objective. Product must not be overdesigned.
- **Marketing:** Marketing department defines customer requirements with clear understanding of value per feature as measured by the customer.
- **Finance:** Finance manager takes care of financial managements of the organization. Moreover he tries to manage the transactions among the prices of various parts in a vehicle. Basically he avoids the overpricing of a vehicle.

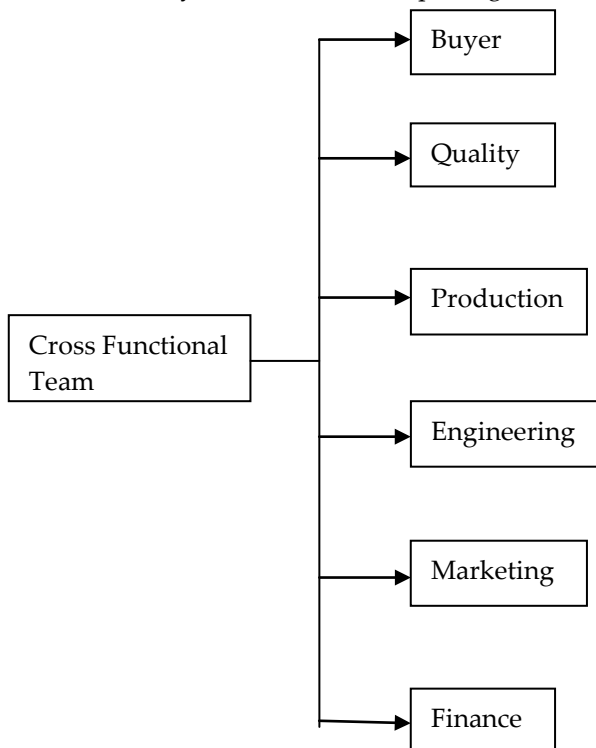


FIG. 1 CROSS FUNCTIONAL TEAM

The basic aim of Go Fast Workshop is to generate and approve the cost reduction VAVE ideas without compromising quality. The time consumed in this workshop is very less therefore it is called as Go Fast Workshop. A Cross Function Team (CFT) consists of Buyer, Quality, Production, Engineering, Marketing and Finance (FIG.1) is formed to speed up the approval processes. The CFT evaluates the proposals

and present all the workable ideas to management for their approval to implement the ideas.

Process Flow of VAVE

The process flow of VAVE (FIG.2) can be understood by the six phases of Go Fast Workshop.

The Six Phases of Go Fast Workshop are as follows:

- Information phase
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation Phase
- Implementation Phase

1) Information Phase

In this phase the VAVE team learns about the background and decisions that have determined the development of the design. This is achieved through a formal presentation of the project by the team leader. Furthermore the team analyzes the key functional issues governing the project such as selection of those parts on which VAVE can be applied, collection of the drawings of all the VAVE parts from Design Release Engineers and collection of the data related to price per part from various suppliers. This procedure forces the participants to think in terms of function, cost and impacts associated with that function. Several functional relationships of processes (Moser Cliff, 2006) can be easily understood by Functional Analysis System Technique (FAST) Diagram.

2) Creative Phase

During this phase the VAVE Team is to think of as many ways as possible to achieve and provide the necessary functions for the project and project components at a lesser initial or Life-Cycle Cost. The team leader encourages the team to be open-minded, inquisitive and creative, and to suspend judgment and critical thoughts entirely. The leader may use "creative thinking" exercises and examples of creative behaviours and thinking that explore program boundaries to encourage the team. During this phase the VE Team is looking for sheer quantity and association of ideas, which will be screened in the next phase of the study (RVPM, 2008).

3) Evaluation Phase

In this phase of the workshop, the VAVE Team

along with the supplier and other stakeholders define the criteria to be used for evaluation. During this phase all the ideas are screened and select those ideas which can be implemented without affecting the performance and quality of vehicle and having viable business case considering the investments and the savings expected.

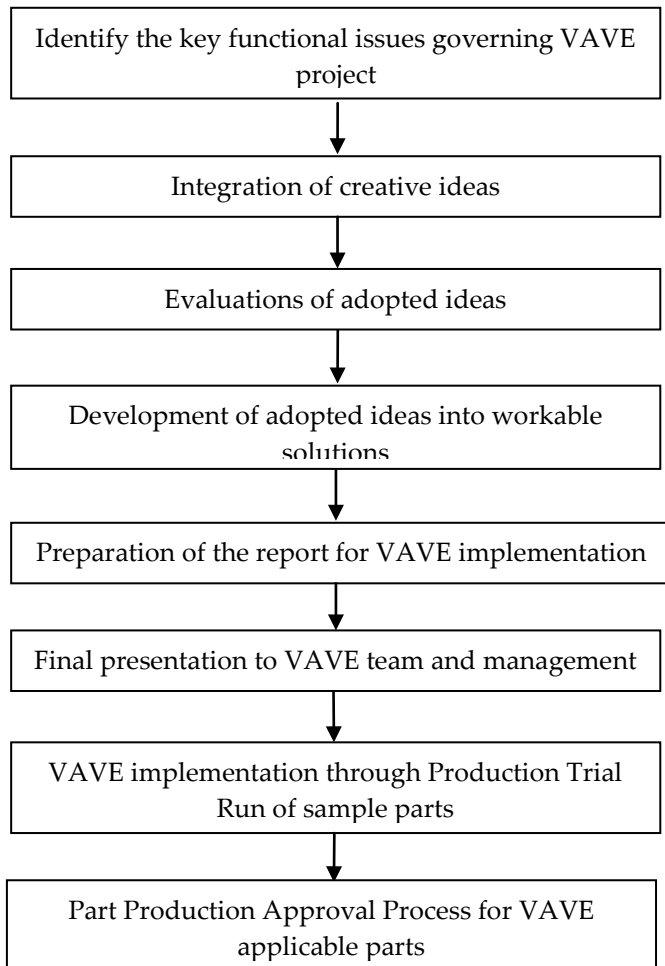


FIG. 2 PROCESS FLOW CHART OF VAVE

4) Development Phase

During the development phase of the workshop, many of the ideas are expanded into workable solutions. In this phase selected ideas are developed into proposals, in which the drawings of the VAVE applicable parts, cost estimation and critical issues related to development of those parts are considered. Required functions (such as source change, geometry change, material or process change etc.) for VAVE applicable parts are clearly mentioned in proposals and cost savings also.

5) Presentation Phase

This phase of the workshop is the presentation of the recommendations in the form of a written

report. An oral presentation of results is made to the supplier and other stakeholders. The recommendations, the rationale that went into the development of each proposal and a summary of key cost impacts are presented at that time so that a decision can be made as to which Value Management proposals will be accepted for implementation and incorporation into the design documents. Supplier is to go ahead for implementing VAVE ideas once those are approved.

6) Implementation Phase

In this phase sample part is submitted by the supplier for approved ideas. The sample part goes under pre trial/ fitment. In which sample is replaced by existing part in the vehicle and checked that it is fit or not. This process is carried out under product engineering department. If there is requirement of any change in geometry/ design after fitment then Engineering Change Request (ECR) is raised. After this pretrial/ fitment if there were no issues, the more samples are submitted by the supplier for Production Trial Run (PTR). In PTR process there are three steps- line trial, pilot-1 and pilot-2. It takes time according to number of parts. After being successful PTR the VAVE applicable parts requires Part Production Approval Process (PPAP).

FAST Model Building

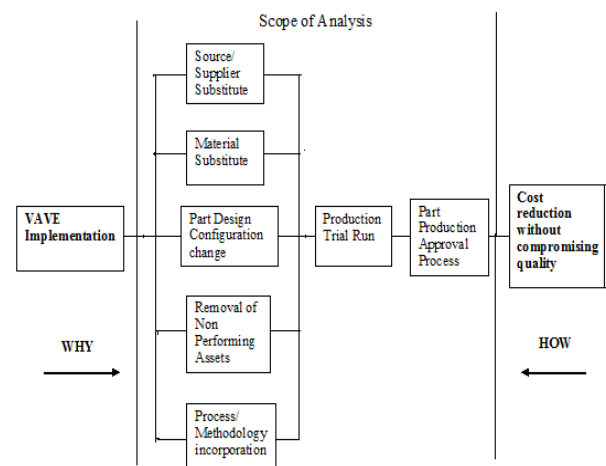


FIG. 3 FAST DIAGRAM

FAST (Functional Analysis System Technique) (FIG.3) is a method to analyze the functional structure of a technical system. It shows 'why' we are applying this and 'how' we will apply this. Here we are implementing VAVE for reducing cost without compromising quality.

There are some scopes of analysis which are as follows:

- *Source/ Supplier substitute*: If the similar parts of the machine can be procured from another supplier at lower cost than by changing the supplier, cost of the component can be reduced without compromising the quality.
- *Material Substitute*: If we change the material of a part in a vehicle which does not affect the life cycle of that part but it increases the product life without increasing the price of that part, so we can substitute the material.
- *Part Design Configuration change*: If design release engineer changes the part design of any component in terms of geometry, size & shape, without increase the overall cost of productions of the concern part for enhancing its performance, then some expenditure is required in the casting of the new part.
- *Removal of Non Performing Assets*: Sometimes some parts or arrangements in a vehicle are of no use or limited use which can be neglected so we can remove these parts or arrangements as these are creating non-performing assets.
- *Process/ Methodology incorporation*: If any process/ methodology incorporated in the vehicle making system is of time or cost consuming so we can change the process/ methodology incurred in the system.

In this study, we perform functional analysis system technique on five main factors affecting VAVE implementation for cost reduction in an automobile industry. FIG.4 illustrates the Fish-Bone diagram which describes all important factors of VAVE, suitable for implementation:

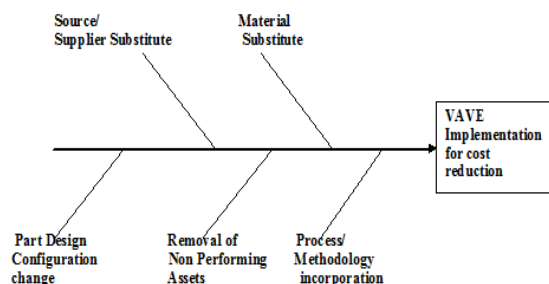


FIG. 4 FISH BONE DIAGRAM OF FIVE MAIN FACTORS IN VAVE IMPLEMENTATION

Discussions & Recommendations

The success of a value engineering program depends on the teams those coordinating different VE activities,

which needs critical and careful observation of group dynamics such as management, team leadership, trust building and conflict resolution among different segments of value engineering systems (parties). A FAST diagram can work as an effective communication tool because it facilitates discussions among the VE team members. Moreover the implementation of Value Analysis & Value Engineering in automobile industry is easily feasible if all the segments of process flow chart for VAVE are carefully studied and followed. This study illustrates the theories of Value Analysis & Value Engineering in automobile Industry through Go Fast Approach with the help of FAST Diagram and to identify the opportunities for its use and application as a Quality Management tool.

The present study recommends the followings for the successful implementation of value analysis & value engineering in the automobile sector:

- Most of the value engineering concepts are extremely sound and possess a very good application prospects in the automobile industry, but there is a lack of knowledge pertaining to its successful implementation, which can be addressed through proper guidance and education.
- It is essential to utilize value engineering concepts and implement it with broader mindset.
- The success of any cost reduction concept needs better coordination with all segments (other parties) of the value system that plays an influential role in project and component level costing.
- Almost all the VE teams are composed of multidiscipline specialists therefore the success of the VE team depends upon a very well qualified team leader with excellent coordinating ability. People with prior experiences in implementing VE programs should be assigned such responsibility.

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